A NEW MODEL OF FLIGHT-INTERCEPTION TRAP FOR SOME HYMENOPTEROUS INSECTS[1]

Lubomir Masner, Henri Goulet[2]

ABSTRACT: A new model of insecticide-treated flight-interception insect trap has been designed for sampling of minute and slow-flying hymenopterous insects (microhymenoptera and Symphyta). Technical data for the new trap as well as comparisons with other types of insect flight traps are given.

Airborne insects can be intercepted by a simple barrier. The most efficient barrier consists of a net-like material, which blends with the background and allows free flow of air. Numerous models of insect flight traps have been designed (Leech, 1955, Gressitt and Gressitt, 1962, Butler, 1965, Townes, 1972, Steyskal, 1981) following publication of the classical prototype by Rene Malaise (1937). Among hymenopterists the most popular recent modification of the Malaise trap has been designed by Townes (1972). The latter trap is superior for its simplicity, light weight, and greater efficiency. However, its usefulness is limited primarily to large and swift-flying Hymenoptera such as ichneumonoid flies and miscellaneous Aculeata which readily climb up the walls and eventually enter the head of the trap. However, the vast majority of parasitic microhymenoptera as well as the slow-flying sawflies appear to be relatively poorly represented in these catches. This may be partly explained by the rather coarse mesh openings of the fabric used in Townes' model, and by the low phototrophic reaction of many insects. Consequently a new trap has been designed to expedite collection of sawflies and microhymenoptera.

Operating principles and efficiency of the new trap

The structure of the new trap is indicated in Fig. 1a. The target specimens of Hymenoptera (microhymenoptera and sawflies) alight on or are blown into the interceptor. The strongly phototropic specimens start climbing up, the less phototropic ones rest or move randomly. Specimens of both groups are soon overcome by a fast-acting insecticide, and fall into the trough.

Our trap is comparable to that designed for flying beetles by Peck and Davies (1980). Both traps are simple flight interceptors with plastic roofs and bottom troughs. However, the two traps take advantage of the different flight techniques of Coleoptera and Hymenoptera respectively. Whereas the Peck-Davies trap operates on the simple principle of "bounce and fall" displayed by most Coleoptera, our trap relies primarily on the principle of rapid poisoning of Hymenoptera.

[1]Received April 10, 1981

[2]Biosystematics Research Institute, Agriculture Canada, Ottawa, K1A OC6

Laboratory tests were designed to determine the effect of a pyrethroid insecticide on various Hymenoptera. Newly emerged adults of *Idris* sp. (Proctotrupoidea, Scelionidae) as well as those of *Pontania* sp. (Tenthredinidae) were allowed to climb on Ambush® (2% solution)-treated polyester fabric. The tiny (1.5 mm) *Idris* wasps did not progress more than 10 cm on the fabric before showing symptoms of poisoning (e.g. loss of positive phototropism) after 30 seconds and fell, on average within 60 seconds of alighting. The larger (7 mm) *Pontania* sawflies managed to climb up the whole of the fabric (132 cm), but fell on average in 4 minutes.

Field tests were carried out from May to the end of September 1980 near Carleton Place, Ontario, adjacent to a mixed forest. Two Ambus®-treated traps (3 m and 5 m length, see below) were operated along with an untreated control trap (3 m length). The catches of both microhymenoptera and sawflies were about 6 times greater in the treated traps than those in the control trap.

Technical data

The new trap consists of three parts (the trough, the interceptor, and the roof), and two chemicals (the insecticide and the trough preservative).

The trough. The trough is made of metal or pliable plastic (assembled as illustrated in Figs. 2 - 4). Plastic troughs may require wooden supports (mouldings, sticks) to keep edges upright, especially with a long trough. The trough should be about 50 cm wide and any length judged practical. As the soil surface is often irregular and sloping, shorter lengths (50 to 75 cm) are easier to install. The total length of the trough(s) should slightly exceed that of the interceptor.

The interceptor. A rectangle (height 132 cm, length 300 cm) of dense (about 0.5 mm between strands), black polyester fabric (such as Dacron or Terylene) is suspended between two ropes sewn into both the upper and lower edges. As black polyester fabric is difficult to find on the market, a white or light colored fabric may be sprayed black (Magix Shoe Spray® No. 35 Black, by Magid Corp., N.Y., available at shoemakers' supplies). The vertical edges of the interceptor are reinforced with black polyester tape.

The roof. The function of the roof is twofold: (1) as a rain cap, and (2) as a barrier for keeping positively phototrophic insects on the interceptor. A clear polyethylene sheet (6 mil.) rests on the rope sewn into the upper edge of the interceptor. The width of the roof is about 60 cm and its length slightly longer than that of the interceptor. Strings tied in each eyelet(reinforced with vinyl tape) keep the roof suspended(Fig. 1c). The side flaps of the roof are taped medially by vinyl tape after the roof is mounted on the rope (Fig. 1b). There should be no gap between the tape and the rope (use odd pieces of tape).

The insecticide. Ambush® (synthetic pyrethroid with permethrin base) is satisfactory for killing insects that alight on the interceptor. The milky water

solution dries rapidly and remains active for 7-10 days. For our protection we used plastic gloves and eye protectors while applying the insecticide. Use flat brush to apply the insecticide.

The trough preservative. A supersaturated salt solution (NaCl) is used in the trough, with a squirt of surfactant (e.g. Extran 300®, Triton X-100®, Fotoflow®) as a surface tension breaker. Salt is an inexpensive preservative, readily available to most collectors. The contents of the trough are collected with a small dip net, then carefully rinsed in fresh water to prevent a buildup of protein coagulant after transfer into 70% ethyl alcohol. The traps should be emptied at least once a week, or more often in hot and rainy weather.

Choice of the site and setting of the trap

Choose a flat open site, preferably with predominant winds perpendic-

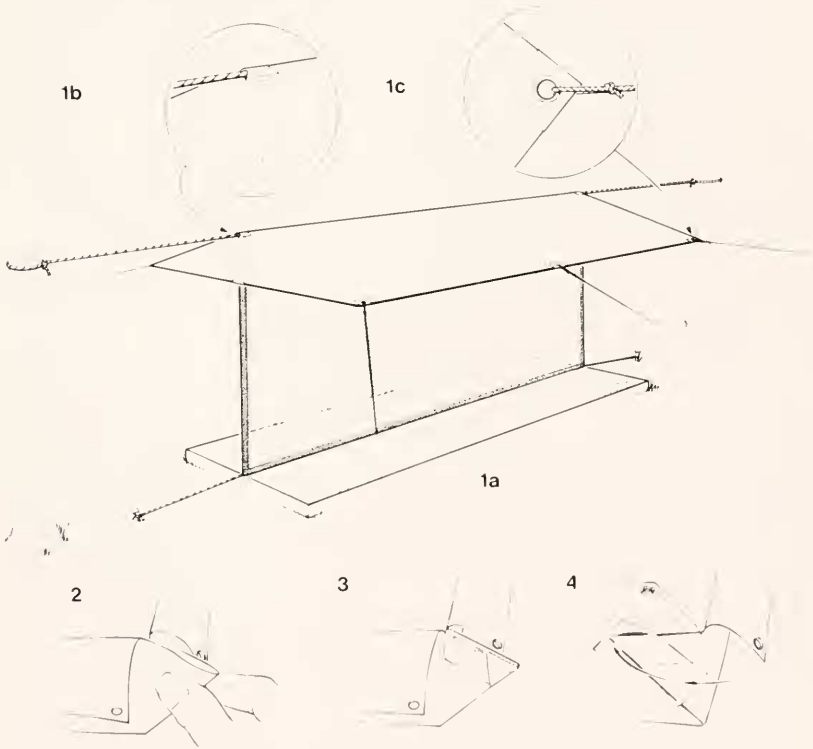

Fig. 1. The trap (1a) as it appears in the field with the roof, the interceptor (stippled), and the trough. Details of vinyl reinforcement of side flaps of the roof (1b) and eyelets along roof lateral edges (1c).

Figs. 2 to 4. Steps in folding and taping corners of plastic troughs.

ular to the interceptor. Windswept edges of forests and natural pathways with a funnel effect (along a trail, stream, etc.), are the best choices. The trap should be exposed to direct sunshine.

The trough should be positioned first (by digging a trench), then the central interceptor installed by suspending the upper rope between two trees or poles, then the roof mounted, the roof flaps taped, the roof strings tied and the trough filled with the salt solution.

Common hazards and failures

The quality and quantity of material collected depends on careful observance of the above instructions, and points listed below.

1. Never rush the selection of a collecting site. Consider all potential hazards to the trap (e.g. vandalism, grazing cattle, game trails).
2. Maintain a high salt content in the solution (allow a thin layer of salt to develop on the bottom of the trough); use inexpensive rock salt.
3. Rinsing of the collected material must be thorough but gentle; use a shower attachment to avoid pounding of specimens. Rinsing may be done in the field by using natural sources of water.
4. If specimens are left in the trough for a prolonged period of time, use maximum care while rinsing the contents. Generally, material from this type of trap should not be treated in ultrasonic cleaners.
5. Whenever possible keep contents refrigerated in alcohol.
6. Since 70% ethanol is not a good long-term preservative, specimens should be critical point dried as soon as convenient (Gordh and Hall 1979).
7. Do not discard residues; colleagues, including the authors, may want to study your unused catches.

ACKNOWLEDGEMENTS

Messrs. B.E. Bowen and S.J. Miller (Biosystematics Research Institute, Agriculture Canada) helped us with the field tests. Mr. F. Bruce Jones (Chipman Inc., Toronto) kindly donated samples of the insecticide for testing. Ms. Susan Rigby (Biosystematics Research Institute, Agriculture Canada) prepared the illustrations. Dr. C.D. Dondale and A.E. Davies (Biosystematics Research Institute, Agriculture Canada) kindly checked the manuscript.

REFERENCES

Butler, G.D. 1965. A modified Malaise insect traps. Pan-Pacif. Ent. 41:51-53.

Gordh, G. and J.C. Hall. 1979. A critical point drier used as a method of mounting insects from alcohol. Ent. News 90:57-59.

Gressitt, J.L. and M.K. Gressitt. 1962. An improved Malaise trap. Pacif. Ins. 4:87-90.

Leech, H.B. 1955. Cheesecloth flight traps for insects. Can. Ent. 87:200.

Malaise, R. 1937. A new insect trap. Ent. Tidskr. 58:148-160.

Peck, S.B. and A.E. Davies. 1980. Collecting small beetle with large-area "window" trap. Coleopt. Bull. 34:237-239.

Steyskal, G.C. 1981. A bibliography of the Malaise trap. Proc. Ent. Soc. Wash. 83:225-229.

Townes, H.K. 1972. A light-weight Malaise trap. Proc. Tall Timbers Conf. Ecol. Animal Control by Habitat Management. No. 3:239-247.